Analyzing metallogenic conditions and exploration in the Mian-Lue-Kang tectonic belt, Shannxi and Sichuan provinces, China

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Keywords. Mian-Lue-Kang tectonic belt, ophiolite, tectonic mélange, metallogenic condition, exploration prospect

The Mian-Lue-Kang tectonic mélange belt is located in Mianxian County, Lueyang County in Shannxi Province, and Kangxian County in Gansu Province. It represents an important part of a plate suture belt recently revealed in the south margin of Qinling orogenic belt. It forms a narrow belt 85 km from east to west, and 10 to 15 km from south to north. The belt extends to Wenxian County in the west and reaches Animaqing; it also approaches Fangxian County Hubei Province through Gaochuan to the east, and forms a divisional regional tectonic belt for Qinling area that is parallel with Shangdan ophiolite stucture melange in the northern Qinling.

With the recent development of multi-discipline studies on Qinling orogenic belt, basic research about the Mian-Lue-Kang tectonic belt has made considerable progress in aspects of composition, tectonic nature, temporal and spatial evolution regularities, and its dynamic character (Zhang et al. 1996, 2001). Metallogenic geological understanding for the belt has also improved but some issues regarding metallogenic conditions and metal ore-forming processes for this anomalous region remain unresolved. Following exploration achievements through recent land and resources surveying in the belt, this paper analyzes primarily the metallogenic conditions and exploration potential for Mian-Lue-Kang tectonic belt, combined with geological reconnaissance practise. The tectonic belt comprises of a series of parallel, different character faults, with all microlithons divided by nappe shear faults and decollement faults to form a tectonic network that extends in east west direction (Fig. 1). Schistosity zones dominated by S1 deformation foliation mainly exist in volcanic sedimentary rocks. Shear deformation between hard and soft rock interfaces plays an important role in multi-metals mineralization. Besides a divsion of stratigraphy in the Archean Group (Yudongzi microlithon), the Sinian system (Xianggongshan microlithon) was deformed during the Indosinian-Yanshan main orogenic period, with sedimentary rocks from Paleozoic era metamorphosed to phyllite, and greenschist in epimetamorphic phase (Tao et al. 1993).

Mian-Lue-Kang tectonic belt underwent an evolution of extensional splitting in initial stages and subduction and collision in later stages. Under the conditions of primary extension, a deep tectonic system generated extensive volcanics that contained metallogenic materials to supply abundant sources for subsequent ore-forming processes. About 90 forming processes. percent of host wall rocks for gold and multi-metals deposits are volcanic rock, which shows the influence of the extensional rift structure on ore.

The formation of tectonically altered rock typed gold deposit relates to stripping the shear belt between basement and overburden of Archean and Proterozoic groups; syntectonic ultrabasic and basic intrusion activity are the main thermodynamic conditionss for metallogenesis for gold formation (for example Jianchaling gold deposit; Wang et al. 1996, 2000). Metallogenic elements (As, Sb and Pb) anomalies and brittle and ductile shear structures are geochemical and tectonic marks for metal deposits emplaced in the belt.

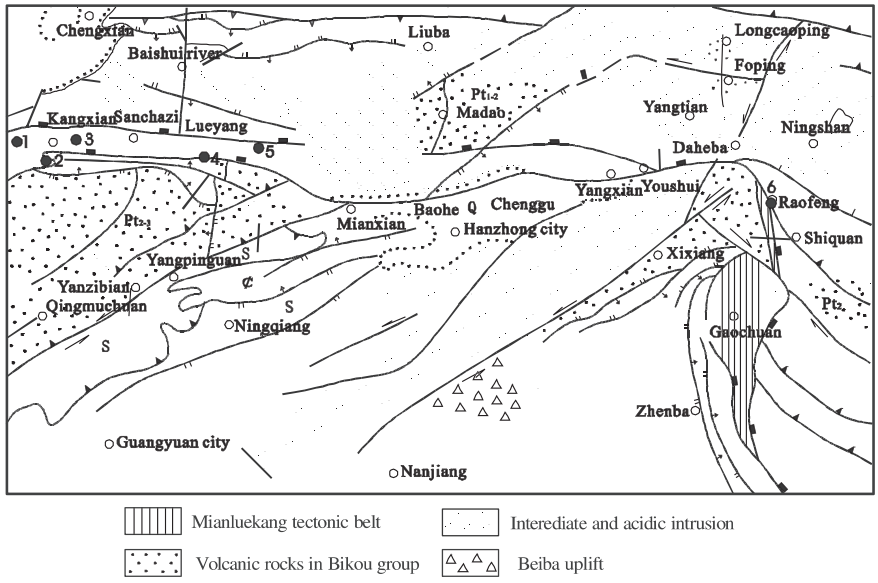

Figure 1: Geological map of Mian-Lue-Kang and adjacent region 1-Ganheba gold deposit; 2-Guachanggou gold deposit; 3-Jinjiahe manganese deposit; 4-Jianchaling Au-Ni deposit; 5-Guandimen lead and zinc deposit; 6-Yangpingwan gold deposit

Mian-Lue-Kang tectonic belt also hosts tectonic ophiolite belts through the evolution of a Paleozoic rift to limited ocean basin to converging orogeny. The composition of ophiolites chiefly include epidote albite schist, chlorite sericite schist (phyllite), chlorite actinolite schist, quartz sericite phyllite, silic rock, slate, serpentinite, mafic magnesite rock, talc magnesite rock, diabase, and gabbro, which constitute different nature tectonic microlithon in big and small hybrid ways.

On the basis of petrologic results of volcanic rock microlithons, the geochemistry and petrochemical features of Jinjiahe microlithon indicate that its protolith was a island arc volcanic rock. The content of SiO_2 ($Ø(SiO_2)$ = 46.65) and $A1_2O_3$ ($A1_2O_3$)=15.38) are lower than that of MORB, and its $\omega(TiO_2)$, $\omega(Fe_2O_3)$, and ω(FeO) are also low, moreover, low K_2O content reflects Jinjiahe microlithon formed in an island arc environment. REE analysres for basic and intermediate basic volcanic rock of Jinjiahe and Guandimen microlithons indicate that there exist two types rock, one depleted REE, its (La/Yb) value is 0.3 to 0.36, (Ce/Yb) 0.33 to 0.42 (La/Sm) 0.55 to 0.83, and ΣNd(t) 6, which approach that of N-typed MORB, the other enriched LREE, its (La/Yb) value is 1.84 to 4. 70, (Ce/Yb) 1.82 to 3.38, (La/Sm) 2.79 to 4.75, which have the character of typical VBA basalt.

The belt is an important section with anomalies of Au, Ag, Pb, Zn, Cu, As, and Sb in Mian-Lue-Yang metal deposit cluster field, where Au distributes in the west and Ag (Pb - Zn) in the east. There are six 10 km long stream sediment anomalies of Au and associated As, Sb, and Hg in Ganheba-Jinjiahe region. Three parallel mineralized strips have been delineated by ravine soil secondary halo densified method in Ganheban anomaly, and a 30 t gold resource has been identified in the centre mineralized strip; at the same time, the other two mineralized strips still have good prospecting potential.

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